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10/798,174

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Udayakumar Cholleti

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EXAMINER

THOMAS, SHANE M

ART UNIT

PAPER NUMBER

2186

DATE MAILED: 10/06/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

10/798,174

Applicant(s)

CHOLLETI ET AL.

Examiner

Shane M. Thomas

Art Unit

2186

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 10 July 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 15, 18 and 20-27 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 15, 18 and 20-27 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_

### **DETAILED ACTION**

This Office action is responsive to the response filed 7/7/2006. Claims 1-14, 16-17, and 19 have been canceled while claims 23-27 are new; thus, claims 15,18, and 20-27 are currently pending. Applicant's amendments to the claims as well as the arguments presented have been carefully considered by the Examiner but are not persuasive and do not place the claims in condition for allowance. Accordingly, this Office action has been made FINAL.

Excerpts from all prior art references cited in this Office action shall use the shorthand notation of [column # / lines A-B] to denote the location of a specific citation. For example, a citation present on column 2, lines 1-6, of a reference shall herein be denoted as "[2/1-6]."

All previous outstanding objections and rejections to the claims and specification not herein discussed have been respectfully withdrawn by the Examiner hereto.

#### ***Response to Arguments/Amendments***

Applicant argues (page 8 of the response) that as claimed, the present claims are patentable over the prior art of record as Arndt does not teach "directly access[ing] memory by physical address." The Examiner points out that such an amendment is not found in the claims, as amended. Neither independent claim 15 nor claim 23 claims directly accessing the memory by a physical address, but only mentions that the devices access memory by a physical device. Such an limitation is explicitly taught by Arndt in [4/29-34] - accessing the memory by a physical address is clearly taught as the requested address is first translated from a virtual address to a physical one (as well known in the art). Thus, it is not clear how the limitation

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distinguishes from the prior art. Yes, a virtual address is sent from the I/O device to access a memory location, but the I/O request does access the memory by physical address as the physical address is obtained and used in the accessing procedure in order to complete the request. Claims 22 and 27 do not teach the argued limitation either since the limitation of the claims only states that the I/O devices access the memory via DMA - taught by Arndt in [1/36-39], [2/11-16], and [5/16-26]. Additionally, the prior art reference of Rogers has been cited to teach the amended limitation of obtaining a lock on the page mapping structure. Rogers further teaches that real pages may be accessed directly (i.e. not using virtual addressing) - ¶40; thus, such a limitation, even if present in the amended claims is not patentable over Arndt in view of Rogers.

### *Claim Objections*

Claims 24 and 26 are objected to because of the following informalities:

Claim 24: there should be a space between “access” and “processor”.

Claim 26: the typographical error “9+claim22” should be corrected to “claim 22”.

Appropriate correction is required.

*Claim Rejections - 35 USC § 112*

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 15,18, and 20-27, are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

As per claims 15, 20,23, and 25 it is not clear whether the term --the page-- (line 18 of claims 15 and 23) refers to the --first physical page-- or the --second physical page-- as the term --the page-- lacks antecedent basis. Nonetheless, for the purpose of expedited prosecution, the Examiner has considered the term to be --the first page--.

Claims 18,21,22, and 24, 26, and 27, are rejected as being dependent on a rejected base claim.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 15,18, and 20-27, are rejected under 35 U.S.C. 103(a) as being unpatentable over Arndt et al. (U.S. Patent No. 6,931,471) in view of Rogers et al. (U.S. Patent Application Publication No. 2004/0064673).

As per claims 15 and 23, Arndt teaches a method for copying data from a first physical page in a memory (which the Examiner is considering to be a combination of physical memory 110 and the entries of the cached TCE table that are stored in the logic 150 [4/35-36]; such an interpretation is in light with scope of the invention of the Applicant as the Applicant teaches that --the memory-- 120 comprises the physical addresses space, a control table, a page mapping structure, and a translation table) to a second physical page (figures 2-4) that comprises:

(1) I/O devices registering access to the memory by physical address (115.X) prior to the access of the memory (figure 2 shows a TCE table storing entries mapping an I/O device to the physical pages it is using and registering the entry before accessing the physical page is taught by Arndt in [5/29-41] since the virtual to physical mapping translation is set before an access to the physical page occurs. In the entry shown in figure 2, a source (i.e. specific device) is recorded (entries 210-230 are linked to a specific device - [4/43-49]) as well as the physical address of the page(s) being accessed - element 115.X for each registered device. The Examiner is considering

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the TCE table 175 of figure 2 to be a page mapping structure as it maps the physical/virtual pages used by each I/O device;

(2) disabling access by the registered devices by signaling to halt access to the physical address space (disables I/O buses to prevent the device whose physical page is being moved from accessing the address space - [5/5-10]), where the registered devices are registered for access to the physical address page using the TCE table - [5/1-10];

(3) copying the data from the first page to the second page [5/27-30];

(4) enabling access to the first page in the memory by signaling the registered I/O device to resume accessing the physical address space (enabling arbitration for the blocked I/O devices - [5/35-41]).

Arndt does not specifically teach obtaining a lock on a page mapping structure corresponding to the first physical page thereby preventing new accesses to the first physical page by one of the I/O devices as Arndt only teaches preventing the already registered I/O device from accessing the physical page while copying occurs. Rogers teaches using a lock system to prevent a page table (TCE table) from being accessed for new accesses to a first physical page (figure 3, step 318) - ¶¶21-22. Once the copying has been taken place, accessing can be resumed by the I/O device by releasing the lock - figure 3, step 336. It would have been obvious to one having ordinary skill in the art at the time the invention was made to have combined the physical page copying system of Arndt with the teaching of mapping table locking of Rogers in order to have prevented a new access to the physical page being moved, as the page being moved could be a defective page ([1/23-26] of Arndt). Preventing accesses to a defective page would have increased data integrity in the system of Arndt.

As per claims 18 and 24, Rogers teaches disabling application memory accesses (figure 3, step 318) prior to copying (step 326).

As per claims 20 and 25, Rogers teaches wherein the copying of the page includes updating a record in the page mapping structure - figure 3, step 328.

As per claims 21 and 26, the signaling of the registered devices to halt access includes accessing a pre-relocation method (Rogers - figure 3, steps 302-324 or Arndt - figure 4, steps 410-430) and the signaling of the registered devices to resume accessing the physical address space includes accessing a post-relocation method (Rogers - steps 328-336 or Arndt - steps 440).

As per claims 22 and 27, the I/O devices access the memory via a direct access (DMA) as taught by Arndt - [1/36-39], [2/11-16], and [5/16-26].

### *Conclusion*

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event,



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however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shane M Thomas whose telephone number is (571) 272-4188. The examiner can normally be reached M-F 8:30 - 5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matt M Kim can be reached at (571) 272-4182. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Shane M. Thomas



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